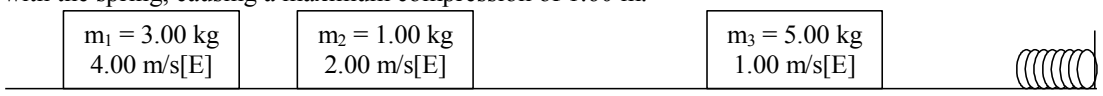
Conservation of Momentum Problems

1. Calculate v_2' and $E_{thermal}$ produced during the partially elastic collision if:
$m_1 = 5.00$ kg, $v_1 = 1.00$ m/s [E30°S], v_1' = 3.00 m/s [E40°N], $m_2 = 7.00$ kg, $v_2 = 5.00$ m/s [E40°N]

(v_2' = 3.17 m/s [E28°N], E_{th} = 32.3 J)

2. Multiple Collisions: In the following diagram, m_1 and m_2 collide inelastically then m_{2+1} and m_3 collide elastically then m_3 collides with the spring, causing a maximum compression of 1.60 m.

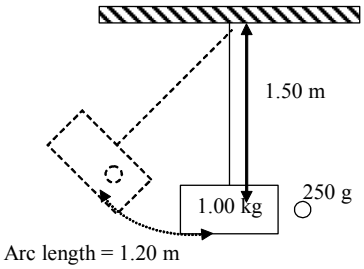


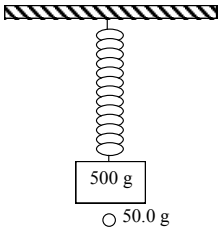
a) Calculate the spring constant b) Calculate Δt from contact to maximum compression and total time in contact with spring c) Calculate maximum acceleration of m_3

(v_{12}' = 3.50 m/s [E]) (v_{12}' = 0.72 m/s [E], v_3' = 3.22 m/s [E]) a) k = 20.3 N/m b) 0.78 s, 1.56 s c) 6.50 m/s^2

3. Ballistic Pendulum: A bullet is fired at a wooden block on the end of a string. Calculate v_1 for the bullet if: ø = 45.8°, h = 0.45 m and v_1' = 3.00 m/s

(v_1 = 14.93 m/s)





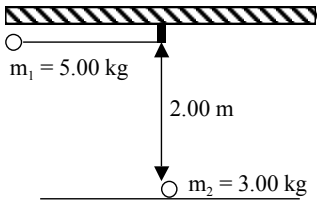
4. Ballistic Spring: Given a spring with an unstretched length of 1.50 m and a length when 1.00 kg is hanging at rest = 2.00 m. (use this to determine k)

If a bullet hits 500 g block suspended from the spring and combination rises 1.00 m. Calculate v_1 for the bullet if the v_1' = 6.12 m/s

(k = 19.6 N/m, v_1 = 67.3 m/s)

5. Another pendulum: m_1 is released from rest and collides with m_2 when it is directly below its pivot point. Calculate h' for m_1 if the collision is

a) inelastic (0.78 m)
b) elastic (0.125 m)



6. Another Multiple Collision problem: The blocks are moving as indicated in the diagram. All collisions are elastic. Determine the velocity of each block after all collisions have occurred. The surface is frictionless.

(v_1' = 10.0 m/s [W], v_2' = 20.0 m/s [E], v_2" = 11.25 m/s [E], v_3" = 16.25 m/s [E])